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# DRAFT TEAM MEMORANDUM

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| **Project Name:** | Puget Sound Beaches Project | **Date:** | 9/16/09 |
| **Client:** | KCDNRP WTD | **Project Number:** | 7562A.10 |
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| **Reviewed By:** | Basin Leads | | |
| **Subject:** | Technical Considerations for Alternative Development | | |
| **Distribution:** | Team | | |



**Introduction:**

The Consultant Team for the Puget Sound Beaches Project has developed CSO control alternatives for each of the four CSO basins. This memorandum describes the technical considerations that were used during the process of alternative development.

**CSO Control Approaches Considered:**

As documented in prior memoranda, CSO control alternatives are defined by three elements: 1) a CSO control approach; 2) a configuration for the approach (e.g., offline storage versus pipeline storage); and 3) available land areas where the approach/configuration could be constructed. The following approaches were considered as a starting point for developing alternatives:

1. Convey and Treat: Peak flows generated in the basin are conveyed to existing treatment facilities by expanding pumping/conveyance piping facilities, and expanding existing treatment plant capacity.

2. Peak Flow Storage: Peak flows are stored in or near the basin during wet/weather events, and metered back into the existing conveyance system for treatment by existing facilities once flows subside. Several types of peak flow storage were considered:

    a. Centralized storage (i.e. a single facility sized to store all of the excess volume required for control). Centralized storage facilities could be constructed at the "bottom of the basin" (i.e., at a location near the existing CSO overflow), or "up-basin" at a point elsewhere in/near the basin. In some cases, "up basin" centralized storage could be achieved by diverting flow directly from the CSS at a point near the "up basin" storage facility. In other cases, "up basin" centralized storage would require a diversion structure near the existing CSO outfall, and a peak flow pump station to convey the flow to the "up basin" storage facility.

    b. Distributed storage (i.e., multiple facilities with a total volume sized to store excess volume required for control). Distributed storage alternatives could include a combination of "bottom of basin" and "up basin" facilities, depending on the availability of peak flows in the existing CSS.

3. End of Pipe Treatment: Peak flows in excess of conveyance capacity are treated at a high rate treatment facility, and the treated flow is discharged to Puget Sound through the existing CSO outfall. End of pipe treatment facilities could be located near the existing CSO outfall, or elsewhere in the basin. If the end of pipe treatment facility is not located near the CSO outfall, a peak flow pump station is required to lift excess flow to the facility.

4. Peak Flow Reduction: Peak flows in the CSS are reduced by disconnecting impervious areas. Disconnected stormwater is routed to a new or existing MS4. Green Stormwater infrastructure (GSI) is also evaluated as a means of Peak Flow Reduction.

**Technical Considerations Impacting Selection of Potential Sites:**

Available land areas where new system components could be sited and constructed were identified in each basin based on the "technical feasibility" of the resulting alternative. "Technical feasibility" was defined as follows:

- Availability of Peak Flows. The resulting alternative must be sited in a location that allows sufficient peak flows to be captured and routed to the new facility.
- Constructability. The resulting alternative (and associated system components) must be constructible on the site. In order for an alternative to be constructible, the site where components would be built must be of sufficient size, with reasonable access provided for construction activities (e.g. staging, shoring, excavation, tank construction, etc.).
- Operational Performance. The resulting alternative (and system components) must be capable of meeting the intended performance within the existing hydraulic profile of the CSO outfall and CSS.

A hierarchy of technical considerations was used to judge "technical feasibility" and identify potential sites for alternatives 1 through 4. They are listed in order from most favorable to less favorable as follows:

1. Favor locations and facility configurations at the bottom of the basin in the vicinity of the existing CSO outfall.
   - Provides ability to capture 100% of the flow in the basin and route it to the new facility.
   - Reduces complexity of control system required to route flows to new facility; thereby reducing risks of future overflows.
   - Minimizes conveyance system construction requirements.
2. Favor locations along existing combined sewer trunk lines through which 50% or more of the total basin peak flow is conveyed.
   - Helps ensure sufficient volumes are captured to adequately reduce peak flows and volumes at the bottom of the basin at the existing CSO outfall.
3. Favor locations and facility configurations which allow a passive diversion of peak flows to new facility (e.g. over a weir wall) rather than more complex control systems requiring telemetry or SCADA.
   - Increases reliability by eliminating the need for power and control system.
   - Reduces the potential need to oversize the facility to limit overflows.

4. Favor locations and facility configurations where the bottom of new structures will not exceed a depth of 30 feet below the ground surface elevation.
   - Minimizes shoring and dewatering requirements.
   - Requires less area for construction and staging.
   - Shallower facilities are easier to access.
   - Avoids excessive structural requirements for tanks and treatment facilities.
   - Increases feasibility of cut and cover construction for storage pipes vs. riskier and more expensive tunneled construction.

Additionally, there were several technical considerations used to judge siting feasibility specifically for pipeline storage, peak flow reduction, and conveyance alternatives development as follows:

1. For storage pipelines within street right-of-way, favor locations where streets are flat (<5% grade); wide (>18 feet); and traffic volumes are low.
   - Minimizes footprint required for shoring and excavation.
   - Increases feasibility of cut and cover construction.
   - Shallower facilities are easier to access.
   - Facilities in lightly traveled streets will be easier to access for maintenance.
2. Favor peak flow reduction projects in areas with large centralized concentrations of connected impervious area.
   - Easier to mobilize construction/disconnection efforts.
   - Easier to verify effectiveness of CSO reduction achieved from disconnection efforts.
   - Higher likelihood of effective CSO reduction in areas identified as connected to CSS compared to individual rooftops potentially identified within the MS4 area.
3. For conveyance pipelines favor alignments that avoid environmentally sensitive areas and reduce impacts on existing infrastructure (streets; below grade utilities; etc.).
   - Reduces environmental impact.
   - Reduces permitting complexity.
   - Reduces public impact.

Table 1 provides an example of how the developed Barton Basin alternatives compare against the technical considerations listed above.

TABLE 1.
COMPARISON OF TECHNICAL CONSIDERATIONS FOR DEVELOPED BARTON ALTERNATIVES

| Technical Considerations for Alternatives Development | 1A Rectangular Storage at Bottom of Basin | 1B Circular Storage at bottom of Basin | 1C Pipe Storage at Bottom of Basin | 1D Pipe Storage in Right-of-Way at Bottom of Basin | 1E Pipe Storage in Upper Fauntleroy Way SW | 1F Rectangular Storage in Vicinity of Fauntleroy School | 1G Rectangular Storage in Upper Basin 416 | 3A End of Pipe Treatment at Bottom of Basin | 4A Peak Flow Reduction |
|---|---|---|---|---|---|---|---|---|---|
| 1. Favor locations and facility configurations at the bottom of the basin in the vicinity of the existing CSO outfall | √ | √ | √ | √ | X | X | X | √ | NA |
| 2. Favor locations along existing combined sewer trunk lines through which 50% or more of the total basin peak flow is conveyed | √ | √ | √ | √ | √ | √ | √ | √ | NA |
| 3. Favor locations and facility configurations which allow a passive diversion of peak flows to new facility over a weir wall rather than more complex control systems requiring telemetry | √ | √ | √ | √ | X | X | X | √ | NA |
| 4. Favor locations and facility configurations where the bottom of new structures will not exceed a depth of 30 feet below the ground surface elevation | √ | √ | √ | X | √ | √ | √ | √ | NA |
| 5. For storage pipelines within street right-of-way, favor locations where streets are flat (<5% grade); wide (>18 feet); and traffic volumes are low | NA | NA | NA | X | √ | NA | NA | NA | NA |
| 6. Favor peak and low reduction projects in areas with large centralized concentrations of connected impervious area | NA | NA | NA | NA | NA | NA | NA | NA | √ |



Legend:
√Technical Consideration Satisfied
X Technical Consideration Not Satisfied
NA Technical Consideration is not applicable